EMPIRICAL INVESTIGATION OF ROLE OF GREEN FINANCE IN REVAMPING NIGERIA ECONOMY

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Abstract

Nigeria economy is at growth trajectory with current economic growth rate of 3.11% in the first quarter of 2022. Despite, there is evidence of huge financing gap to achieve and sustain higher economic performance at national level. This study, therefore, specifically investigates the effect of green bonds by both corporate organisations and federal government on gross domestic production in Nigeria using data obtained from various sources for a period between 2017 and 2021 relying on Cobb-Douglas production function. Estimation procedures through Ordinary Least Square technique reveal that, on average, 1% increase in corporate green bond issue brings about 56.8% increases (CGB: coefficient value = .5681) in Nigeria gross domestic product for the period under review. Similarly, on average, for every 1 per cent increase in sovereign green bond issue by Nigeria Federal Government the country gross domestic product increases by approximately 107 per cent (SGB: coefficient value = 1.716). However, corporate green bond was found to be statistically insignificant (CBG: p-value > .05 = 0.175) at 5% level of significance while sovereign green bond was significant (SGB: p-value < .05 = 0.044) at the same level of significance. Thus, the researchers affirm that sovereign green bond significantly contributes to improvement in Nigeria economy through expansion of gross domestic production. The researchers recommend that federal government should increase the issuance of sovereign green bond consistent with a view to achieving 2015 Paris Agreement target and 2016 Sustainable Development Goals.

Keywords: Green Finance, Green Bond, Economy, Production Function

Introduction

Nigeria economy is at growth trajectory with current economic growth rate of 3.11% (year-on-year basis) in the first quarter of 2022 (National Bureau of Statistics, 2022). However, it is comparatively low to what is obtainable in some similar sub-Sahara African countries like Seychelles and Botswana. For instance, Seychelles and Botswana are currently maintaining economic growth rates between 4.6% (year-on-year) and 4.1% respectively (World Bank, 2022). Thus, the situation of economic reality in Nigeria illustrates the need for revamping the economy toward achieving accelerated growth through green growth. In actual fact, classical endogenous growth theory posits that for economy to improve across sectors in a country the need for financing cannot be overemphasized. Within the context of this study, a sustainable finance that supports resuscitation of the whole economy via green economy is linked with green bond. However, there is shortage of sufficient investment capital in Nigeria partly due to low level of financial development. This reason formed top priorities of Nigeria government to introduce Green Bonds in 2017 following the country's commitment to 2015 Paris Climate Agreement and announcement of Sustainable Development Goals (SDGs) in March 2016 (Joint Report by Financial Sector Deepening Africa [FSD] Africa, Climate Bonds Initiative [CBI] and FMDQ Group, 2022; Chiemeka, 2021).

The objective of the green finance funding mechanisms is to provide financial means to support sustainable environmental projects through which low carbon economy and green economy can be attained. In this manner, green economy can be promoted and ultimately contribute to economic growth. However, the extent to which this feat can be achieved in Nigeria is greatly unexplored by limited research available in this field. According to Desalegn and Tangl (2022), scholars in African countries are not significantly contributing to green finance research unlike Asian countries. Against this backdrop, this study is posed to specifically investigate the effect of green bond on gross domestic production in Nigeria. The focus of the study is limited to green bonds issued in Nigeria between 2017 and 2021. A study of this nature is important to address growth-hindered issues associated with Nigeria economy relative to use of debt instruments. Several studies such as World Bank (2019); Tu *et al*, (2020a); and Tolliver *et al* (2020b) have documented evidence that green bonds as forms of debt instruments can help to construct a more sustainable

economy. Also, the study can help provides pointer to the reliability of application of green finance to improve economy, reduce poverty and promote employment opportunities in Nigeria and in developing countries with similar structural factors. In essence, this effort has potential to provide action-based advice for policy formulations toward achieving number one SDG goals (no poverty) in Nigeria given high level of unemployment, unabated inflation, and frequent fluctuations in naira-dollar exchange rates in the country.

Green finance is a financial vehicle which involves increased funds flow from financial institutions and investors both in public and private sectors to promote sustainable development programmes and priorities. It is a way of providing mechanisms for maintaining and improving environmental resources and energy for the benefits of present and future generations. In this manner, green finance serves as an enabling factor for promoting sustainable development in the areas of economic, social and environment across economies. Specifically, in the context of the current study, green finance is interpreted to mean green bond. Green bond is a bond usually issued by governments to finance or refinance projects that have potentials to benefit the environment (Desalegn & Tangl, 2022; Dou & Qi, 2019). This type of debt instruments has longer maturities with low financing cost thereby making it more attractive for national governments to embrace for achieving sustainable development through green projects. These projects which are usually large in sizes and financial resources like energy use projects and hydro-carbon projects have greater capacities to contribute to increased gross domestic products occasioned by green economy. With green bonds, pressures on environments can be significantly reduced. This can be achieved by addressing emissions produced by green- house gas, controlled pollution, and efficient use of natural or environmental resources. The issuance of green bonds instruments in green bond markets is at accelerating rate among economies particularly in Europe and Asia to actualize objectives and commitments to 2015 Paris Climate Agreement (Cortellini & Paneta, 2021).

In Nigeria, the first sovereign green bond amounted to ₦10.69 billion was issued by federal government in 2017 following the country's commitment to 2015 Paris Climate Agreement and announcement of Sustainable Development Goals (SDGs) in March 2016 (FSD Africa, CBI & FMDQ Group, 2022; Desalegn & Tangl, 2022). Theoretically, the relationship between revamping Nigeria economy and green bond can be effectively understood within the Cobb-Douglas production function framework developed by Paul Douglas and Charles Cobb in 1928. The model shows the relationship between production output and inputs (capital and labour) employed to achieve such output. According to Cobb-Douglas production function, the rate of output production is dependent on the responsiveness or elasticity of output to rate of changes in capital and labour as production factors respectively. Relatively, achieving improvement to Nigeria economy is contingent upon the use of green finance. In this manner, whatever the outcome of positive changes to environmental-resource based sectors can be observed as elasticity of these sectors production performance to the rate of green bond issued by Nigeria Federal Government. Moreover, Cobb- Douglas production model can reveal the extent or degree of relationship between green finance and investments from financial markets (e.g. Capital Markets), institutional investors and the rate of improvement across all sectors in developing economies like Nigeria.

Further, empirical studies linking green finance with economic revitalization or economic improvement is currently limited across economies although research on green finance is at increasing level. Most of the available limited empirical evidences on green finance and green investment are from studies conducted in China. Also, China is the most active country in research on green finance and green investment as over 70 scholars from different institutions have made giant strides in green finance publications (Desalegn & Tangl, 2022). The other two countries that follow China in this field are Pakistan and United Kingdom (Desalegn & Tangl, 2022). Despite, only few studies document evidence of impact of green finance on green growth and inclusive economic growth. Among these studies are Zhang (2015); You (2018); Chen *et al* (2018); Liu (2019); and Wang and Wang (2020). Zhang (2015) employed panel regression method to analyze inter-provincial data obtained over a period from 2004 to 2011 in China and found that green finance in different regions offer different development effect. The study found further that green finance promotes inclusive economic growth at national level.

Meanwhile, the previous results are similar to what Wang and Wang (2020) observed in China having used spatial econometric model to analyze panel data obtained from 31 provinces in the country from 2005 to 2019. Liu (2019) also shared similar empirical evidence with findings by Zhang (2015) and Wang and Wang (2020). You (2018) and Chen *et al* (2018) observed via panel data positive impact of green finance by Chinese government on rapid economic development in China. Interestingly, the evidence of positive impact of green finance on inclusive economic growth in China is also obtainable among many countries in Asia being the region with most significant

studies on green finance and green investment than any region in the world (Desalegn & Tangl, 2022). Unfortunately, this important evidence is missing in Africa partly due to limited or no research on relationship between green finance and inclusive growth in the continent. According to Desalegn and Tangl (2022), only two published research articles on green finance were found in Africa (one from Nigeria and another from South Africa) from 2015 Paris Climate Agreement to current period 2022. In other words, a research required to fill this gap is essential. This requirement forms the crux of the current study.

Methodology

This study empirically investigates the role green finance plays in revamping Nigeria economy. Specifically, the study analyzes the relationship between green bond and gross domestic production in Nigeria within the theoretical framework of Cobb-Douglas production function model. In reiteration, The Cobb-Douglas production function model shows the relationship between production output and inputs (capital and labour) employed to achieve such output. Herein, production output is interpreted to mean gross domestic product while input is particularly restricted as green finance (or green bond). The study adopts ex-post facto research design. According to some authors in extant literature on empirical studies involving research studies such as Saka and Aladelusi (2022); Saka and Fatogun (2021); Saka (2021); Amusa and Saka (2017); Creswell (2014); Wooldridge (2001), quantitative ex post-facto research strategy permits the testing of causal-effect relationship between predictor(s) and outcome of interest that has occurred prior to the research study under consideration. Thus, the outcome of the design allows proper and informed inferences drawn upon. The population of the study consists of all sectors of Nigeria economy covered by statistical bulletin of Central Bank of Nigeria (CBN, 2022). By definition, total production outputs of these sectors account for the country gross domestic product (henceforth, GDP). With this coverage, sampling procedure becomes impracticable. Consequently, secondary data for a period between 2017 and 2021 were obtained on green bond investments and GDP in Nigeria from various sources. These sources include a Joint annual report by FSD Africa, CBI and FMDQ Group (2022), Debt Management Office (2022) and CBN Statistical Bulletin (2021). Econometrically, the model of the study is formulated within the study theoretical framework (Cobb-Douglas production function model). The model by Cobb and Douglas (1928) is given as:

$$Y = A(t)L^{\beta_1}K^{1-\beta_1} \quad \text{..... (1)}$$

Where Y = Output; A = Constant technology; L = labour; K = Capital; β_1 and $1-\beta_1$ are coefficients of input factors (L and K). Consistent with Cobb-Douglas production model, the study model is developed as follows;

$$GDP = f(GreenBond) \quad \text{..(2)}$$

$$GDP_t = \alpha + \beta_1 GRB_t + \mu_t \quad \text{..(3)}$$

Where GDP = Gross Domestic Product; GRB = Green Bond; α = model intercept; β_1 = slope coefficient of GRB; μ_t = error term at time t; t = time period (1 ..... 5)

Unlike equation 1, green bond representing capital stock is considered as the only input factor in equation 3 and time trend is assumed by the study to be short for green bond issuance in Nigeria and as such unconsidered in equation 3.

Equation 3 is further expanded in equation 4 to include all forms of green bonds (that is, both corporate green bonds and sovereign green bonds) issued in Nigeria between 2017 and 2021 as:

$$GDP_t = \alpha + \beta_1 CGB_t + \beta_2 SGB_t + \mu_t \quad \text{..(4)}$$

Where CGB = Corporate Green Bond; SGB = Sovereign Green Bond; β_1 and β_2 are model slope coefficients.

The equation 4 was transformed into logarithm-based equation. This transformation procedure occurs for two reasons. Firstly, turning multiplicative equation 1 into a linear relationship in equations 2, 3, and 4 requires log transformation of variables of interest. Secondly, when logarithms of variables are applied data distributions of variables behave in a better manner (Wooldridge, 2006). Consequently, equation 4 is transformed into logarithm-based equation 5 as:

$$LNGDP_t = \alpha + \beta_1 LNCGB_t + \beta_2 LNSGB_t + \mu_t \quad \text{..(5)}$$

Where LN = Natural Logarithm

The formulated linear model in equation 5 above was analyzed with Ordinary Least Square estimation technique at 5% level of significance. Following the study theoretical background, β_1 and β_2 are expected to be greater than zero. Thus, both corporate green bonds and sovereign green bonds are expected to produce positive impact on gross domestic product in Nigeria.

3. Results

This sub-section presents the outcome of estimation procedure of data analysis for the study via STATA 12 as statistical software. The results thereof are contained in Table 1 below.

Table 1: OLS Time Series Estimation Result
Dependent Variable: LNGDP

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      Source |       SS       df       MS              Number of obs =       5
-------------+------------------------------           F(  2,     2) =   15.02
       Model |  2.0681e+09     2  1.0341e+09           Prob > F      =  0.0064
    Residual |   137738160     2  68869079.9           R-squared     =  0.6376
-------------+------------------------------           Adj R-squared =  0.5751
       Total |  2.2059e+09     4   551471992           Root MSE      =  8298.7

------------------------------------------------------------------------------
      LNGDP |      Coef.   Std. Err.      t    P>|t|                 Beta
-------------+----------------------------------------------------------------
      LNCGB |      .5681   357.6891     2.06   0.175              .3703679
      LNSGB |       1.716   534.5675     4.61   0.044              .8293695
      _cons |      23.88   9621.644     9.94   0.010
------------------------------------------------------------------------------
Post-estimation Test
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of LNGDP

         chi2(1)      =    1.27
       Prob > chi2  =   0.2606
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Source: STATA 12 Outputs (2022)

4. Discussion

The information in Table 1 contains OLS estimation results of the analysis of data obtained for the study. The final model of the study (Equation 5) was found to be adequate and more fitted for the data obtained for the study. This adequacy is informed by the overall significance of the model as implied by probability value of F-statistics (Prob > F = 0.0064) when compared with the study adopted level of significance. The results show that on average ₦23.88 billion had being raised from green bonds issued in Nigeria between 2017 and 2021 through corporate green bond (CGB) and sovereign green bond (SGB). Empirically, an increase in the issuance of both corporate green bond (CGB) and sovereign green bond (SGB) has tendency to contribute positively to Nigeria economy. *Ceteris paribus*, coefficient estimates show that 1% increase in corporate green bond issue brings about 56.8% increases in Nigeria gross domestic product for the period under review. The coefficient of SGB reveals that for every 1 per cent increase in sovereign green bond issue by Nigeria Federal Government the country gross domestic product increases by approximately 107 per cent.

However, in terms of variable significance, corporate green bond was found to be statistically insignificant (CBG: p-value > .05 = 0.175) at 5% level of significance while sovereign green bond was significant (SGB: p-value < .05 = 0.044) at the same level of significance. This implies that only funds mobilized via sovereign green bond significantly improve Nigeria gross domestic product when it comes to issuance of green bonds in the country. In terms of variable contribution, the Beta (standardized coefficients) estimates show that sovereign green bond is more important to Nigeria economy improvement than corporate green bond. Meanwhile, the R-square statistic shows that

green bond accounts for almost 64% variation in Nigeria gross domestic product. The high value of this measure further illustrates the dominance of green-based economic activities in Nigeria GDP. According to United Nations Environment Program report (2021) more than half of world's GDP depends on environment.

Further, the outcomes of the study analysis are consistent with both theoretical framework and a priori expectation of the study. The result shows that the rate of gross domestic production in Nigeria is dependent on the responsiveness or elasticity of output to rate of changes in investment funds raised through green bonds particularly sovereign green bonds. This outcome is consistent with postulations of Cobb-Douglas production function model. The Breusch-Pagan / Cook-Weisberg test for heteroskedasticity indicates acceptance of null hypothesis of constant variance. This implies that the classical OLS assumption of heteroskedasticity of the model error variance which is very essential for time series analysis is not violated. Moreover, the findings in this study are consistent with previous results in Zhang (2015); You (2018); Chen *et al* (2018); Liu (2019) and Wang and Wang (2020). These studies had earlier documented positive relationship between green bonds and inclusive economic growth in Asia and China at large.

5. Conclusion

This study specifically investigates the effect of green bonds by both corporate organisations and federal government on gross domestic production in Nigeria using data obtained from various sources including FSD Africa, CBI and FMDQ Group Report (2022), Debt Management Office Report (2022) and CBN Statistical Bulletin (2022). The relationship between the study variables of interest was analyzed within Cobb-Douglas production function theoretical framework for a period 2017 to 2021. Expectedly, the results of time series analysis via STATA 12 indicate that both corporate green bond and sovereign green bond exert positive impacts on gross domestic production in Nigeria. However, sovereign green bond is found solely as significant green bond to improve Nigeria economy by increasing level of gross domestic production in the country. Thus, the researchers affirm that sovereign green bond significantly contributes to improvement in Nigeria economy through expansion of gross domestic production.

The study recommends that federal government should increase the issuance of sovereign green bond consistent with a view to achieving 2015 Paris Agreement target and Sustainable Development Goals. Again, there is need for more private sector participations in the issuance of corporate green bond particularly by Deposit Money Banks (DMBs) given success of Access Bank ₦15 billion 15.5 per cent Fixed Rate Senior unsecured Green Bond in 2019. Also, relevant and appropriate policies that will aid private investments in green finance should be formulated by regulatory authorities.

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